

**Claims**

1. A biocompatible non-porous matrix based on  
chitosan and an acid, in particular a hydroxy  
5 carboxylic acid.
2. The non-porous matrix as claimed in claim 1 in the  
form of a sheet, of a hollow article or of a roll.
- 10 3. The non-porous matrix as claimed in claim 1 or 2,  
characterized in that the hydroxy carboxylic acid  
is selected from glycolic acid, lactic acid, malic  
acid, tartaric acid, citric acid and mandelic  
acid, in particular lactic acid.
- 15 4. The non-porous matrix as claimed in any of claims  
1 to 3, obtainable by:
  - providing an aqueous solution of a chitosan and  
of an acid, in particular a hydroxy carboxylic  
20 acid, which is present on excess
  - drying the solution without freezing and
  - removing excess acids before or/and after the  
drying.
- 25 5. A biocompatible matrix system comprising at least  
one biocompatible non-porous matrix as claimed in  
any of claims 1 to 4 and at least one  
biocompatible porous matrix.
- 30 6. The matrix system as claimed in claim 5,  
characterized in that at least one biocompatible  
porous matrix has a structure based on chitosan  
and an acid, in particular a hydroxy carboxylic  
acid.
- 35 7. The matrix system as claimed in claim 6,  
characterized in that the biocompatible porous  
matrix is obtainable by:

- providing an aqueous solution of a chitosan and of an acid, in particular a hydroxy carboxylic acid, which is present in excess,
  - freezing and drying the solution, in particular by sublimation under reduced pressure and
  - removing excess acid before or/and after the freezing.
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8. The matrix system as claimed in any of claims 5 to 10 7, characterized in that non-porous matrices and porous matrices are each disposed alternately in layers.
9. The use of a non-porous matrix as claimed in any 15 of claims 1 to 4 or of a matrix system as claimed in any of claims 5 to 8 for the in vitro culturing of cells.
10. The use as claimed in claim 9, characterized in 20 that the matrix system comprises ligands, e.g. factors for growth of cells.
11. The use as claimed in claim 9 or 10 for culturing 25 cartilage tissue, for reconstructing bone tissue, as filling material for bioreactors for producing cells, proteins or viruses, as microcarrier of filling material for bioreactors, for generating capillaries and blood vessels, for generating optionally multilayer skin systems, for culturing 30 blood stem cells, for regenerating nerve tissue and for generating artificial organs.
12. The use of a non-porous matrix as claimed in any 35 of claims 1 to 4 or of a matrix system as claimed in any of claims 5 to 8 as implant without previous cell colonization.

13. The use as claimed in claim 12 for cartilage and bone defects, as microcapillaries or as surgical filling material.
- 5 14. A biocompatible matrix based on chitosan and an acid, in particular a hydroxy carboxylic acid with anisotropic structures.
- 10 15. The matrix as claimed in claim 14, characterized in that it comprises fibers or chambers in parallel alignment.
- 15 16. The matrix as claimed in claim 14 or 15, characterized in that it is porous.
17. The matrix as claimed in any of claims 14 to 16, obtainable by:
- providing an aqueous solution of a chitosan and of an acid, in particular a hydroxy carboxylic acid, which is present in excess,
  - 20 - anisotropic freezing and drying the solution, in particular by sublimation under reduced pressure and
  - removing excess acid before or/and after the
  - 25 freezing.
18. A biocompatible matrix system comprising at least one biocompatible anisotropic porous matrix as claimed in any of claims 14 to 17 and at least one
- 30 biocompatible non-porous matrix.
19. The use of an anisotropic matrix as claimed in any of claims 14 to 17 or of a matrix system as claimed in claim 18 for the in vitro culturing of
- 35 cells or as implant without previous cell colonization.
20. A biocompatible matrix based on chitosan and an acid, in particular a hydroxy carboxylic acid,

characterized in that it comprises nucleic acids in chemically coupled-on form.

- 5 21. The use of a biocompatible matrix based on chitosan and an acid, in particular a hydroxy carboxylic acid, for culturing cartilage tissue, for reconstructing bone tissue, as filling material for bioreactors for producing cells, proteins or viruses, as microcarrier of filling material for bioreactors, for generating capillaries and blood vessels, for generating optionally multilayer skin systems, for culturing blood stem cells, for regenerating nerve tissues and for generating artificial organs.
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- 15 22. The use as claimed in claim 21, characterized in that the matrix is obtainable by:
- providing an aqueous solution of a chitosan and of an acid, in particular a hydroxy carboxylic acid, which is present in excess,
  - 20 - freezing and drying the solution, in particular by sublimation under reduced pressure and
  - removing excess acid before or/and after the freezing.
- 25 23. The use as claimed in claim 21 or 22, characterized in that the matrix is sterilized.
- 30 24. The use as claimed in any of claim 21 to 23, characterized in that cells are cultured in a density of  $10^6$  or more cells per  $\text{cm}^2$  on or in the matrix.